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### Relating production and perception of L2 tone

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## 1. INTRODUCTION

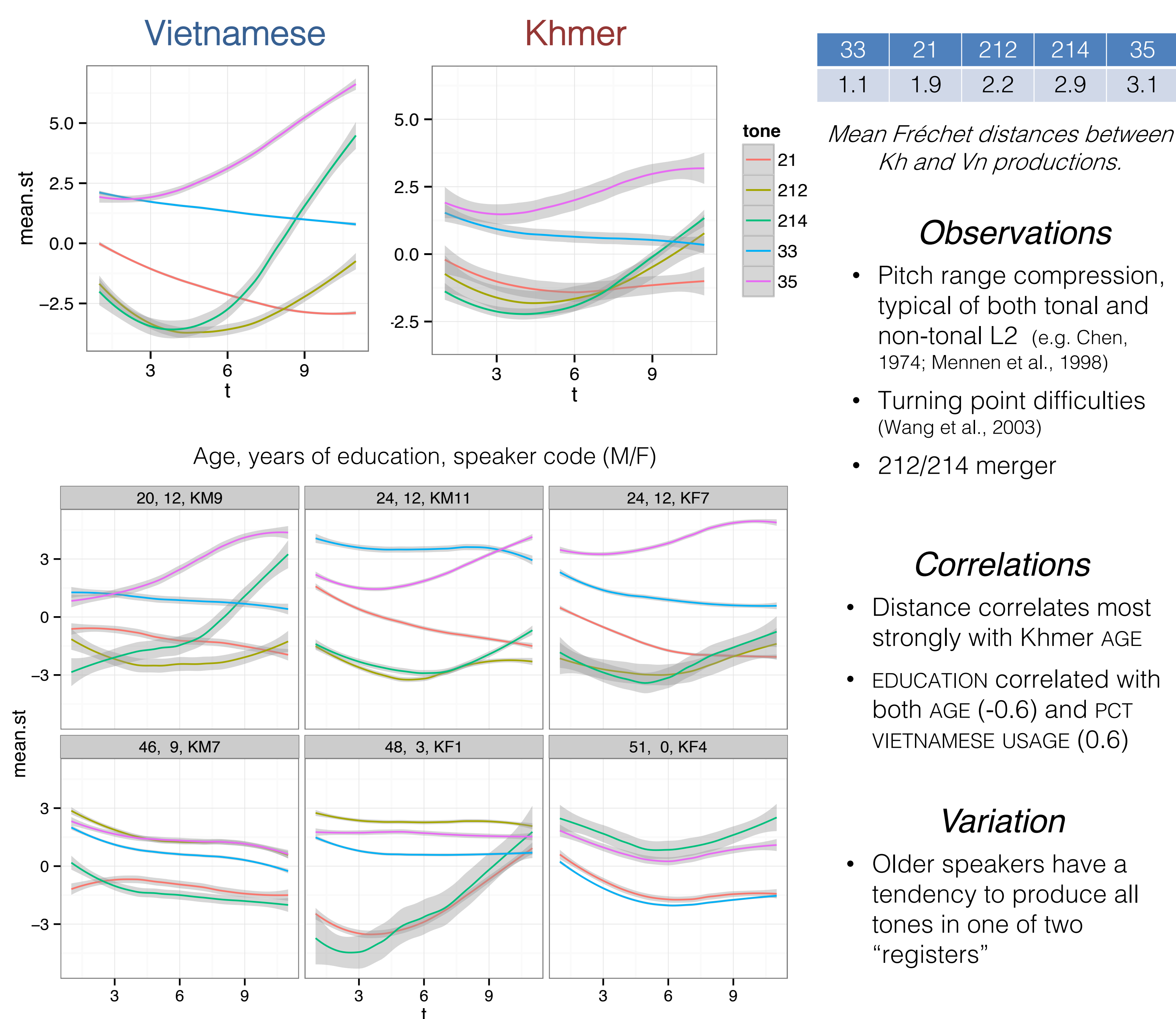
What is the relationship between L2 production & perception?

- Flege (1999): (segmental) L2 production accuracy **limited by perception**: correlations may exist, but predicted to be modest in advanced learners.
- Strange (1995): perceptual difficulties may persist **even after production is mastered**; performance may be uncorrelated
- For **tone**, consensus seems to be that **production leads perception** (Yang, 2012)

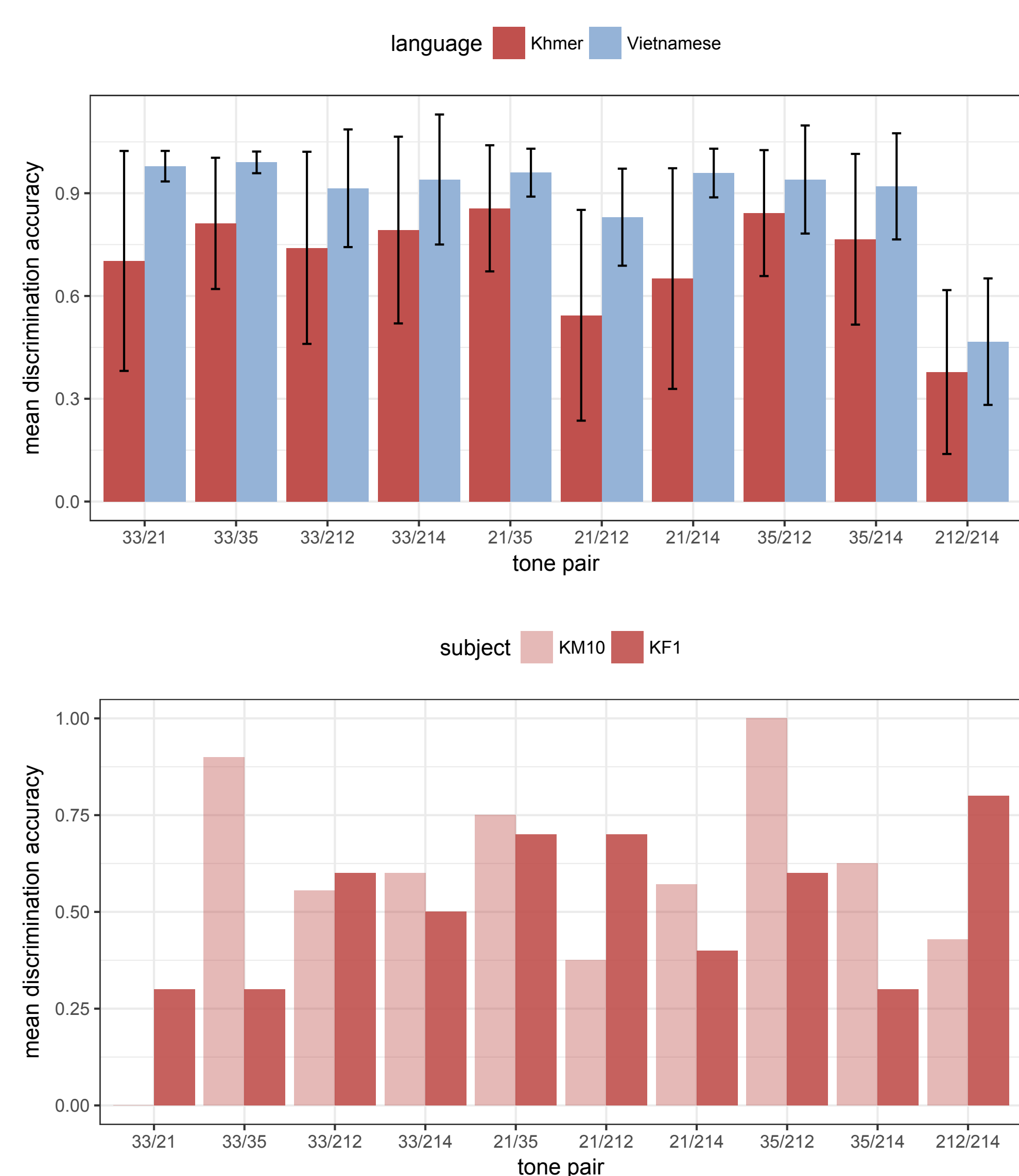
**Our study: speakers of a non-tonal language (Khmer) speaking a tonal L2 (Southern Vietnamese)**

- How well do Khmer-dominant speakers distinguish L2 tones in **production**?
- What dimensions are used by Khmer and Vietnamese listeners in **perception**?
- How can we measure the **relationship** between L2 production and perception?  
*Idea 1*: How well does perception predict similarity to a native target?  
*Idea 2*: How well does perception predict distance **between L2 productions**?

## 3. PRODUCTION



## 4. AX DISCRIMINATION



### Observations

- Vn: 89% Kh: 71%
- Khmers have most difficulty when pitch ranges overlap
- 212/214 hard for everyone

### Correlations

- EDUCATION best predicts overall Kh accuracy (0.5)
- Negative correlation with AGE (-0.4)
- USAGE not correlated (0)

### Variation

- Perception can be **good** if productions are **distinct**, even if **non-native** (e.g. KF1 21/212, 212/214, 21/214)
- Perception can be **poor** even when production is **objectively native-like** (e.g. KM10 33/21, 33/212)

## 2. METHODS & MATERIALS

Kiên Giang Province (ក្រុងស៊ី)

- Home to ~200k Khmers (10% of both provincial population & total in Vietnam)
- Robust, but Vietnamese usage on the rise

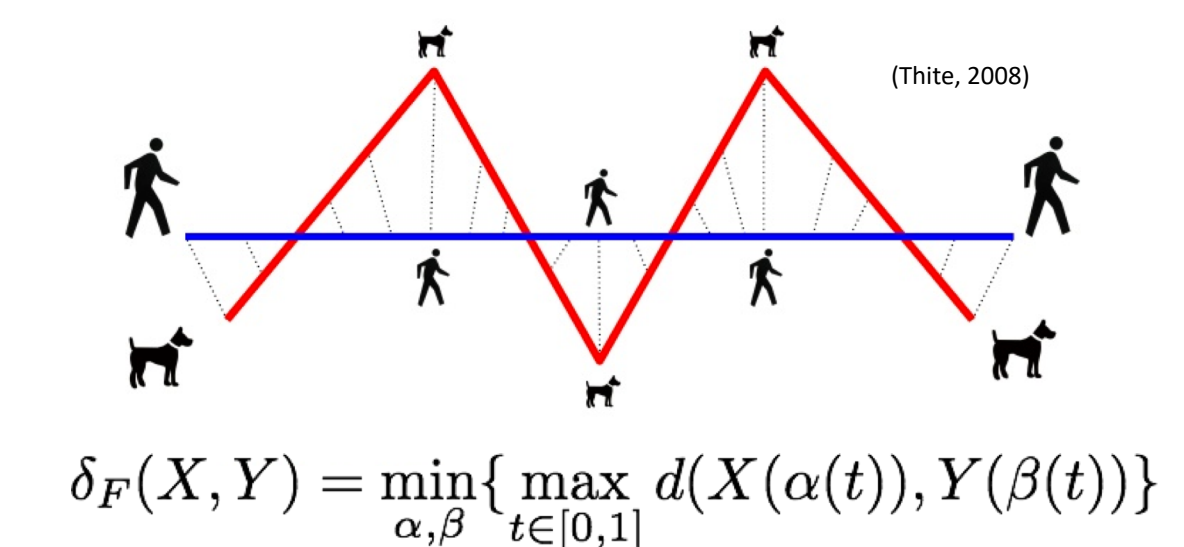
Participants and method

- Group **Vn**: 10 speakers of Southern Vietnamese (18-47, 5 F)
- Group **Kh**: 18 speakers of KG Khmer w/L2 Southern Vietnamese (19-52, 7 F)
- Production**: syllable /ta:/ with each of 5 tones, 3 times in carrier phrase
- Perception**: AX discrimination, 30 stimulus pairs, 5 reps, 300 msec inter-stimulus interval



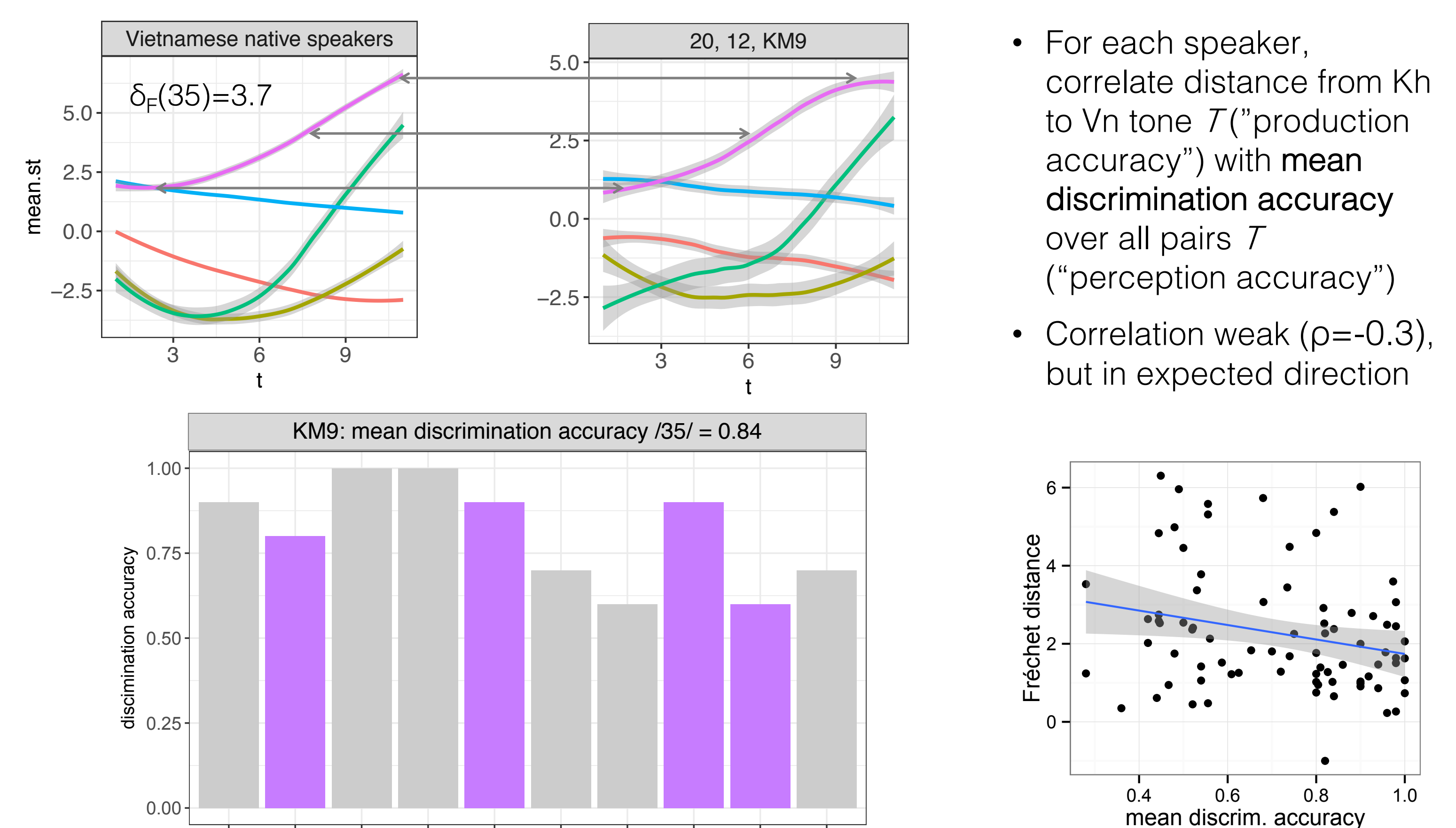
Distance metric

- Fréchet distance**: minimizes the maximum distance between two curves
- Provides a global measure of similarity

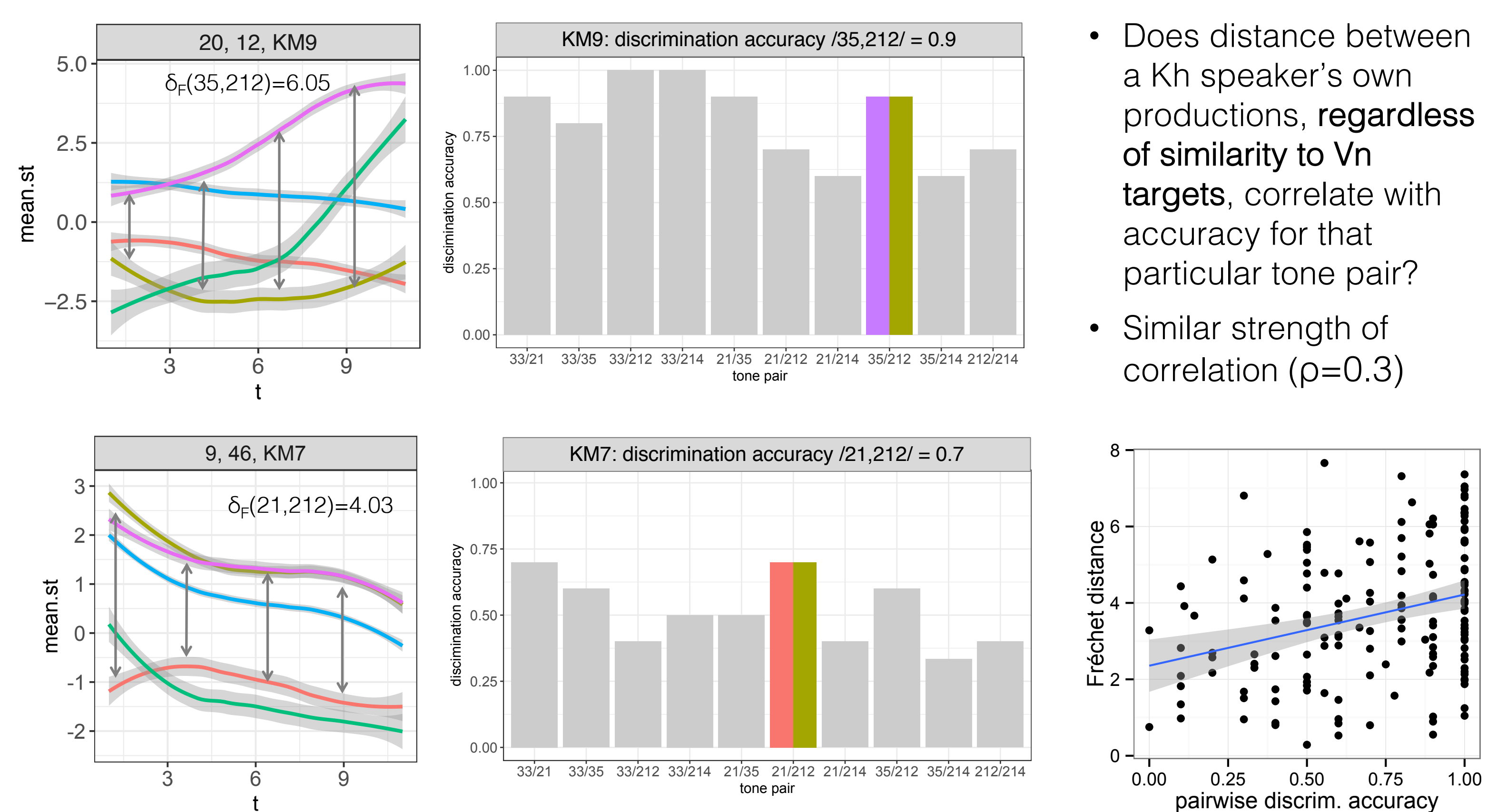


## 5. PRODUCTION:PERCEPTION

Idea 1: distance from native target ~ mean discrimination accuracy



Idea 2: distance between L2 pairs ~ pairwise discrimination accuracy



## 6. CONCLUSIONS

- Perceptual difficulties may persist even if production is 'mastered'
- Perceptual difficulties may (also) be related to *speaker-specific* acoustic separation (at least for tone)
- 'Accuracy' in L2 tone mastery involves more than just approximating a native speaker target